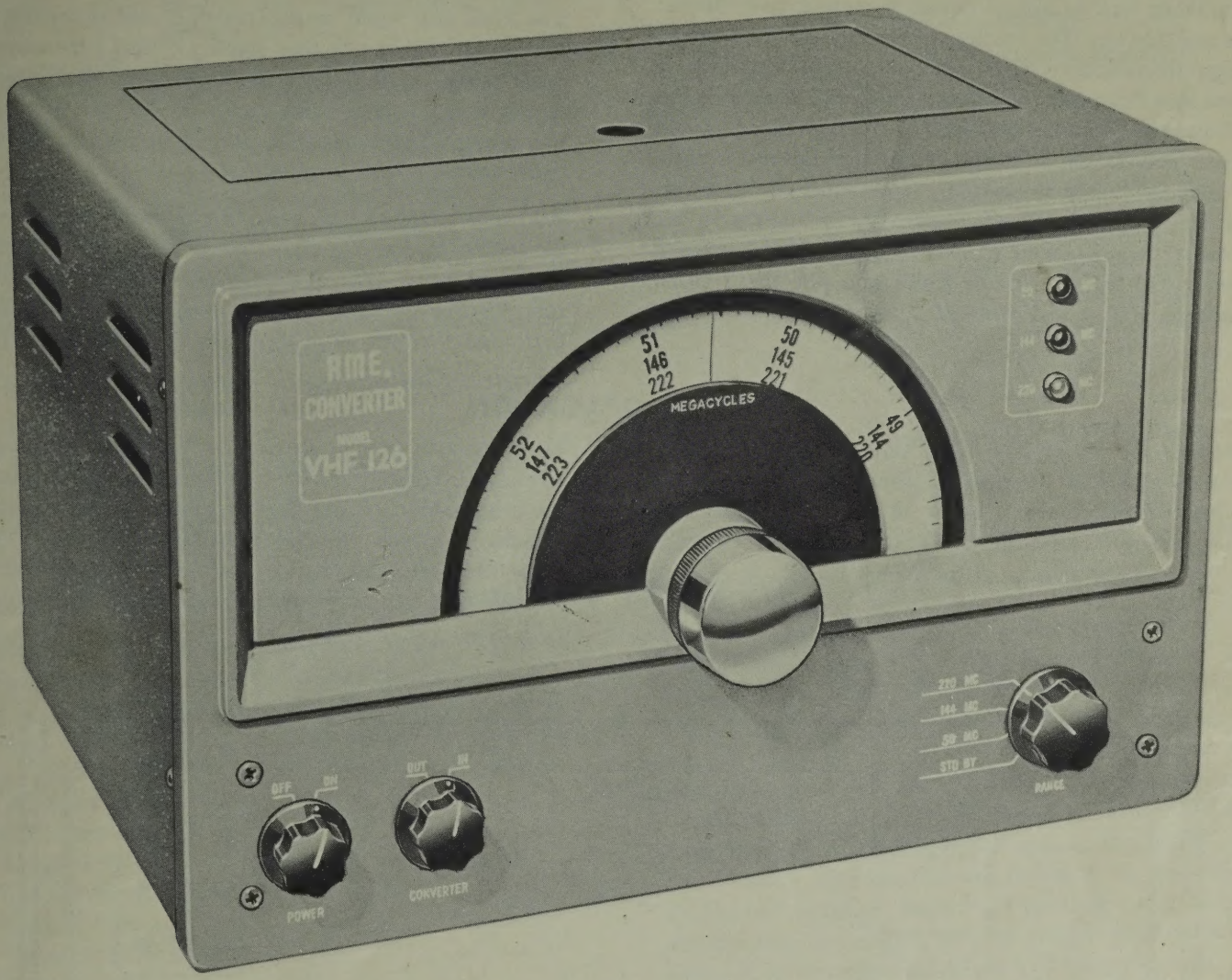
Model VHF126 Converter



RME

Electro-Voice®

RME DIVISION • ELECTRO-VOICE, INC. • BUCHANAN, MICHIGAN

INTRODUCTION

The material and information compiled in the following pages has been assembled for the purpose of providing the user of a VHF 126 converter with information which will acquaint him with the communication performance and operation of the instrument. Most questions which arise in connection with the use of the converter will be answered in these pages. Correct procedures for adjustment during operation and for service purposes are presented. The instructions should be read carefully before using the instrument.

GENERAL DESCRIPTION

The RME VHF 126 very high frequency converter with its own power supply was designed for use with any conventional communication type receiver to extend its range to cover 50 mc, 144 mc and 220 mc. The function of the unit is to convert the very high frequencies received by it to a fixed frequency of 7 mc and then fed to the receiver, amplified and detected in the normal manner. For the two higher frequency ranges, double conversion results. On all ranges the image response is practically eliminated since the output (50 mc tuner) is 7 mc and the first IF for the fixed tuned crystal controlled unit is 50 mc. The auxiliary controls on the receiver such as the beat frequency oscillator, noise limiter, RF and audio gain plus the S meter will function in a normal manner.

The 220 and 144 mc converter units employ overtone series mode crystal oscillators and one doubler.

The RME dual speed tuning control is used to provide fast or micrometer tuning. At slow speed (75 to 1) the converter is easily tuned to all frequencies. The heavy steel cabinet and chassis give adequate shielding to all RF circuits to prevent leak-through from unwanted external signals and to minimize radiation.

All bands are tuned with equal ease since the 50 mc tuner does the tuning for the two higher bands in the same way it tunes the 50 mc band. The quality of the converted signal will be controlled by the quality of the associated receiver. Excellent performance results when used with the RME 4350A receiver.

VHF PROPAGATION

To get the most out of your VHF 126 you should have an understanding of VHF progagation. Propagation above 50 mc differs considerably from that below 50 mc so to get the maximum pleasure and satisfaction from your converter, it is suggested you read the chapter in the ARRL Handbook entitled "About VHF"

It is useless to attempt any serious VHF work unless efficient antennae are employed. There are many types of antennae, but the most common is the Yagi of three elements or more. An antenna handbook will give specific details. The VHF 126 tunes below 50 mc to 48.4 mc, and in this range are commercial stations which can be monitored to indicate band openings.

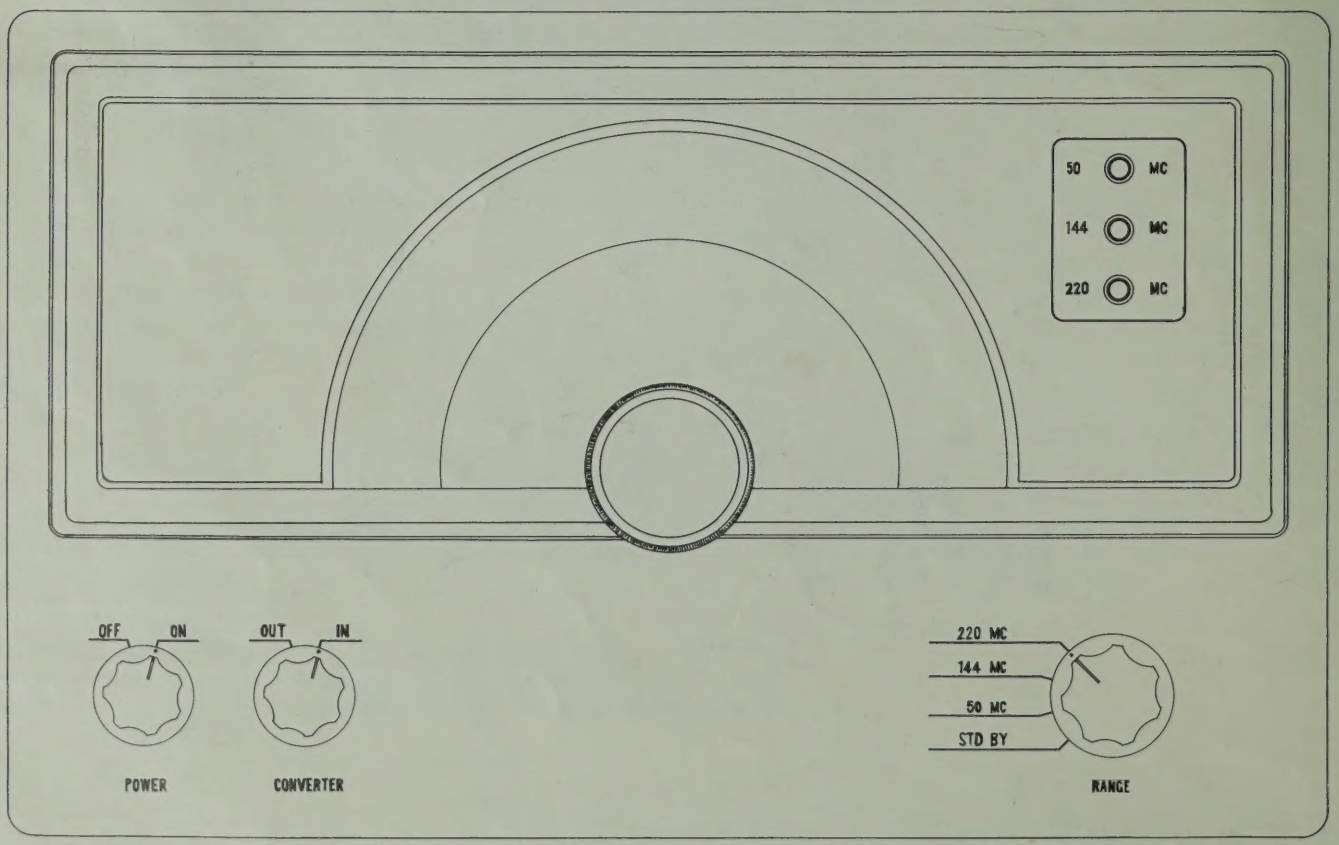


Fig. 1 — Front Panel Layout

SPECIFICATIONS

Frequency Range:	Band in use is indicated by panel light. Band 1. Red 48.4 to 54.2 mc Band 2. Green 143.4 to 149.2 mc Band 3. White 219.4 to 225.2 mc
Sensitivity:	.5uv at 15 db $\frac{\text{sig.}+\text{noise}}{\text{noise}}$ ratio (30% modulation — all bands)
Noise Figure:	50 mc 2.5 db 144 mc 4.0 db 220 mc 6.0 db
Calibration:	Direct — mc — subdivided in 100 kc division
Tuning Control Ratio:	75:1 and 1:1 Resolution, slow speed, 3° per kc
Frequency Drift:	Measured on 50 mc unit. 25 kc or less five minutes after receiver turned on. After 30 minutes warm-up random drift averages a maximum of 500 cycles.
Converter IF:	49-54 mc (Crystal controlled)
Tuner IF:	7 mc
Antenna Input Impedance:	50 ohms through coax fitting using RG-58/U cable
Output Impedance:	50 ohms, nominal, to receiver through RG-58/U cable
Auxilliary Antenna Input Terminals:	Terminal strip provided for receiver low frequency antenna. Receiver antenna switched in or out from front panel of VHF126.

Tubes:	6BQ7A	Cascade RF amp. 50 mc unit
	6U8	Mixer-Cathode follower. 50 mc unit
	6AF4A	Tuner oscillator
	2-6AM4	Grounded grid amplifier. Fixed converter
	2-6BQ7A	Oscillator-doubler. Fixed converter
	2-6BQ7A	Mixer Followers. Fixed converter
	5Y3GT	Rectifier
	OA2	Voltage Regulator

Controls:	A. Power, on, off B. Converter out-in C. Frequency band selector D. Tuning, dual speed
External Connections: (Rear Chassis)	A. 50 mc coax antenna input B. 144 mc coax antenna input C. 220 mc coax antenna input D. Low frequency antenna terminals E. Line cord F. Line fuse
Power Input:	60 Watts, 115 V-50/60 cycles
Weight:	32 lbs. net, 36 lbs. shipping
Dimensions:	16½" wide x 10" deep x 10" high

OPERATION PROCEDURE

After unpacking the converter and determining that all packing materials have been removed from the cabinet interior and that all tubes are properly seated, place the instrument in its operating position and connect the antennae and set the following controls as indicated:

1. AC Power—Off
2. Converter—Out
3. Range—Standby
4. Connect 50 mc antenna
5. Connect 144 mc antenna
6. Connect 220 mc antenna
7. Connect low frequency antenna
8. Connect converter output cable (RG-58/U) to reeciver antenna terminals

The power supply plug may now be plugged into the source (117 V-50/60 cycle AC). When the connection of cables is made, the switch marked "CONVERTER" should be set to position "IN", the switch marked "POWER" is turned to "on" and the communication receiver tuned to 7 mc. After this adjustment is made and the receiver is ready for operation, the VHF 126 band selector switch should be set to the frequency range desired. A panel light will indicate the band in use and the divisions of calibration are indicated on the dial. Since all dial increments are the same, it is only necessary to associate the divisions on the scale with the proper numerical identifications. If it is not practical to use a frequency of 7 mc, a variation of plus or minus 20 kc from 7 mc may be used. Although the converter dial tuning mechanism is approximately three

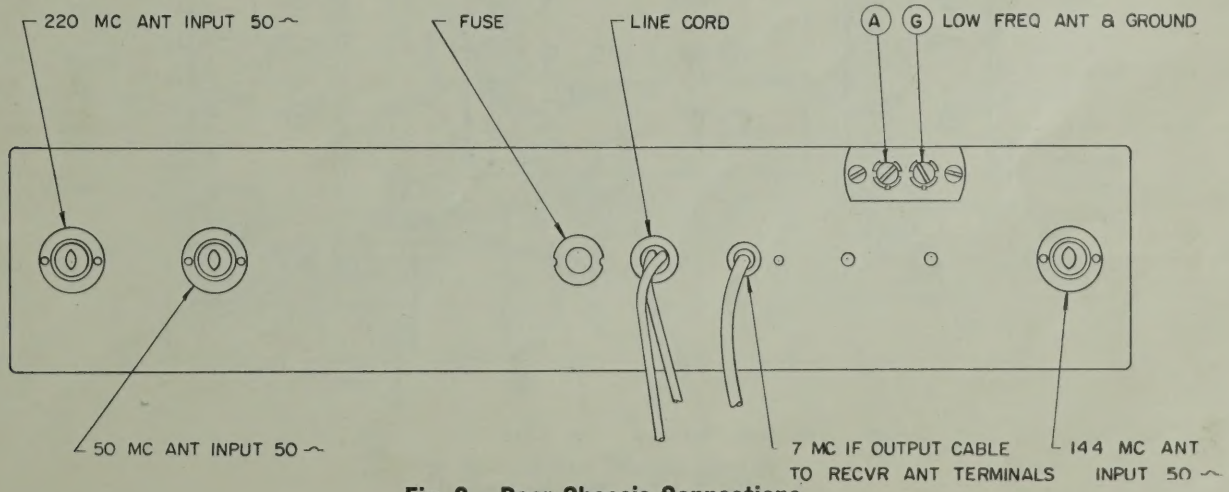

220 MC ANT INPUT 50 ~
FUSE
LINE CORD
A
G
LOW FREQ ANT & GROUND
50 MC ANT INPUT 50 ~
7 MC IF OUTPUT CABLE TO RECVR ANT TERMINALS
144 MC ANT INPUT 50 ~

Fig. 2 — Rear Chassis Connections

degrees per kc, sometimes a finer or more readable adjustment will be desired. In this case, the tuning mechanism of the receiver can be used while allowing the VHF 126 converter dial to be left fixed in setting.

When you scan the lower 300 kc of the 50 mc amateur band, set the receiver dial to 7.3 mc and the VHF 126 converter dial to 50.3 mc. The tuned frequency under these conditions will be 50 mc. Then, by tuning the receiver down toward 7 mc, the actual system tuning will proceed from 50 mc to 50.3 mc spreading out the tuning over a greater range and still maintaining accuracy of frequency reading, determined by the receiver scale in actual kc of variation.

DX TUNING – To detect weak carriers set the receiver to manual gain control and BFO on. Since the AGC is switched out, the receiver may easily overload unless the RF gain control is used carefully. The AF gain control should be set about ½ to ¾ maximum and the RF gain control reduced for adequate sensitivity. Overloading of the receiver when the RF gain control is too high and the AF gain control too low, will result in a blocking effect producing a poor note on the received signal.

The BFO must be set on one side of the carrier frequency by a sufficient amount to give the correct beat note. Never zero the BFO to the receiver and then tune the receiver to get the proper beat as this will cause a reduction in the sensitivity and the quality of the beat tone. Much greater system sensitivity is possible in this way and weak signals that might otherwise be passed over can be located and received.

SPURIOUS RESPONSE – When tuning the 220-225 mc band an internal response or two may be detected in the range from 221 to 223.5 mc due to harmonics of the scan tuner oscillator creating image signals in this range. Filtering and shielding has been provided to reduce these signals to a minimum. If an image signal should fall on a desired signal, the interference can be eliminated by changing the 7 mc conversion frequency by a few kc and returning the converter. The identifying characteristics of the spurious signals will be of the "fast tuning" quality. They will be much more difficult to tune since they vary with tuning control adjustment at a much faster rate than the incoming signal.

ALIGNMENT PROCEDURE

A. Instrumentation:

To properly align the VHF 126 converter certain test instruments are required:

1. VTVM with RF probe accurate at frequencies to 170 mc and minimum loading of 1 megohm and a probe capacity of 4 mmfd or less.
2. Accurate signal generator with ranges to include 7 mc, 48 to 54 mc and preferably, in addition, 144-148 mc and 220-225 mc.
3. A sweep generator having a 5 mc sweep at 50 mc, 144 mc and 220 mc and marker frequencies.
4. A communication type receiver which tunes to 7 mc.
5. A noise generator with 50 ohm output impedance.
6. A cathode ray oscillograph.

B. Procedure:

The steps for complete alignment are:

Step 1. Set associated receiver to 7 mc or not lower than 20 kc and feed a 7 mc signal to the tuner mixer (6U8) by inserting the end of an insulated wire lead from the signal generator down through the tube shield top opening and along side the tube to couple to the tube and obtain a 7 mc response. This response is peaked by adjustment of L14 (see Figure 3).

Step 2. Connect signal generator to 50 mc input jack on chassis (rear apron) and insert a signal at 49 mc. Adjust C48 to approximately ¼" screw extension from top of mounting clip and adjust L15 to obtain response to inserted signal, with dial of VHF 126 set to 49 mc.

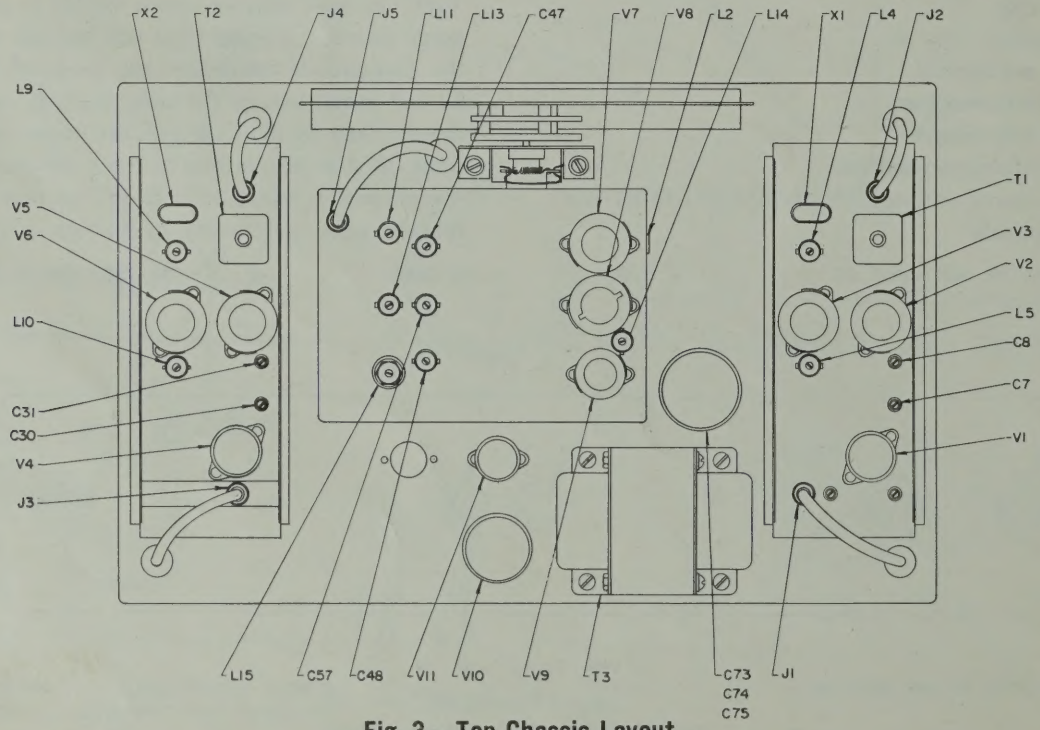


Fig. 3 – Top Chassis Layout

(NOTE: Make certain that with tuning dial rotated to maximum low frequency scale reading 48.4 mc, the tuning capacitor is fully closed.)

With the 49 mc response maintained adjust C57 & C47 to same screw length extension as C48 (¼") and then adjust L13 & L11 to peak receiver response. If any "pulling" of oscillator is observed, detune converter from 49 mc slightly and adjust L13 to maximum noise response.

Step 3. Set signal generator to 54 mc and check calibration of converter. If converter tuned to a higher frequency than 54 mc reduce capacity of C48 (counter clockwise rotation) and increase L15 by a clockwise rotation until band edges are calibrated. If the VHF 126 tunes 54 mc at a lower frequency, reverse above procedure—increase C48 and decrease L15 until band limits coincide with correct frequencies. Intermediate points should fall as calibrated if variable capacitor plates are not bent.

Step 4. Check trimming of RF circuits at each end of the range (L11, L13, C47, C57). If when peaked at the low end (49 mc) these circuits require more capacity at the high frequency end then increase C47 or C57, whichever circuit is involved, and decrease inductance L11 or L13 respectively. If less capacity is required at the high end when the trimming is checked, reverse the process just described.

Step 5. Disconnect signal generator and connect noise generator to input jack for 50 mc antenna. Adjust L11 slightly in the increased inductance direction about ½ to 1 turn or to give optimum noise figure. When this has been done adjust L2 until noise figure is again at optimum. When the above steps are completed the 50 mc tuner section of the converter is aligned for standard performance. A noise figure from 2.8 db to 3.5 db is obtained with the unit adjusted as described.

Step 6. Alignment of either strip converter for 144 mc or 220 mc is accomplished by means of a first check of the frequency generator section to make sure oscillator and doubler are working and then a sweep test of the 50 mc output IF transformer should be made using a sweep from 49 mc to 54 mc.

The frequency generating circuits are checked by connecting an RF VTVM probe having a range of 0-1.5 or 0-5V at the grid of the mixer tube (pin 2 of V2 for 144 mc unit or pin 2 of V5 for 220 mc unit). A voltage of 0.5V or greater should be measured when the oscillator is working and the doubler is peaked.

For typical adjustment take the 144 mc unit: the adjustment of the oscillator coil slug L4 will start the oscillator and as clockwise rotation is increased the oscillator output will rise and then start to fall slightly after which point continued rotation will cause it to suddenly cease oscillating. The adjustment should be set at the point somewhat before oscillation stops. The doubler inductance adjustment, L5, is adjusted and left at the position of maximum voltage at pin 2 of the mixer tube V2. The same type of adjustment applies to the 220 mc converter unit. In this case the actual adjustment points are for the oscillator L9, and for the doubler L10. Frequencies involved: for 144 mc oscillator 47.5 mc doubler 95 mc and for 220 mc unit the oscillator frequency is 85.5 mc and the doubler frequency is 171 mc. The test points mentioned are accessible only when the main outer shield of the respective fixed frequency converter strips are removed from the chassis. Actual physical access to the frequency generator circuits is obtained by removal of an additional shield. These shields should all be replaced to make the converter meet the F.C.C. spurious radiation requirements.

Step 7. IF transformer alignment is achieved by using a sweep generator operating at 49-54 mc and fed into the pin 2 of V2 for check of the 144 mc strip or pin 2 of V5 for check of the 220 mc strip. Adjustment of T1 and T2 (primary and secondary) slugs to give a flat topped response between 49 and 54 mc should be made as observed on a C.R.O. connected across the 2nd detector output of the associated receiver.

Step 8. RF alignment is achieved by using a sweep generator as in step 7 and using as a frequency range 144 mc—148 mc or 220 mc—225 mc as the case may require and fed into the proper antenna input jack. Band pass shaping is achieved by adjustment of C7 and C8 for 144 mc to 148 mc and C30 and C31 for 220 to 225 mc.

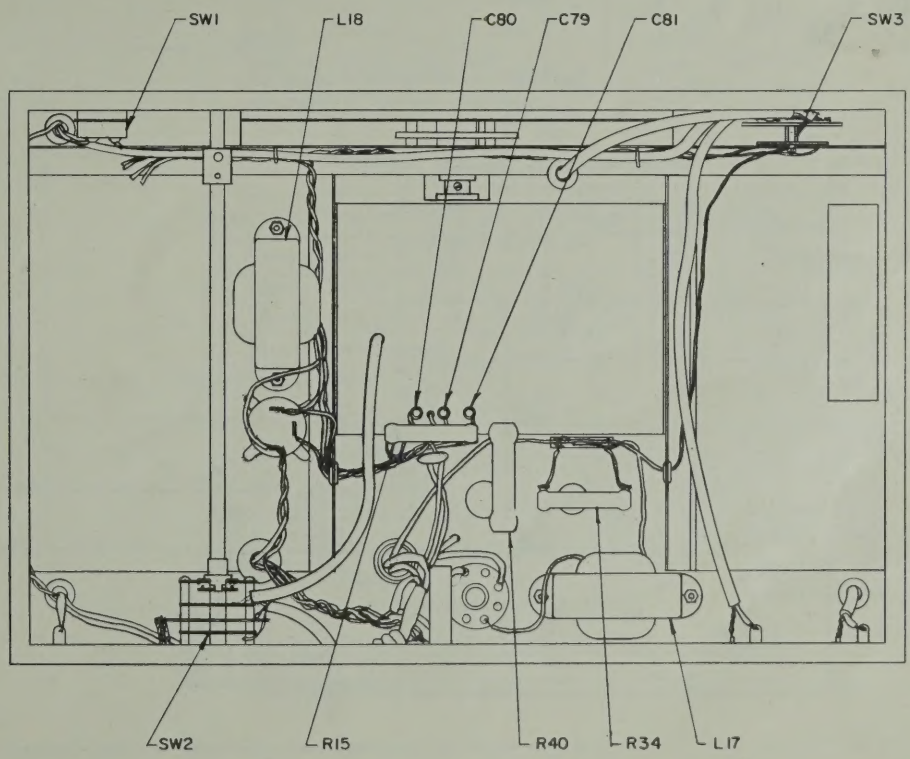
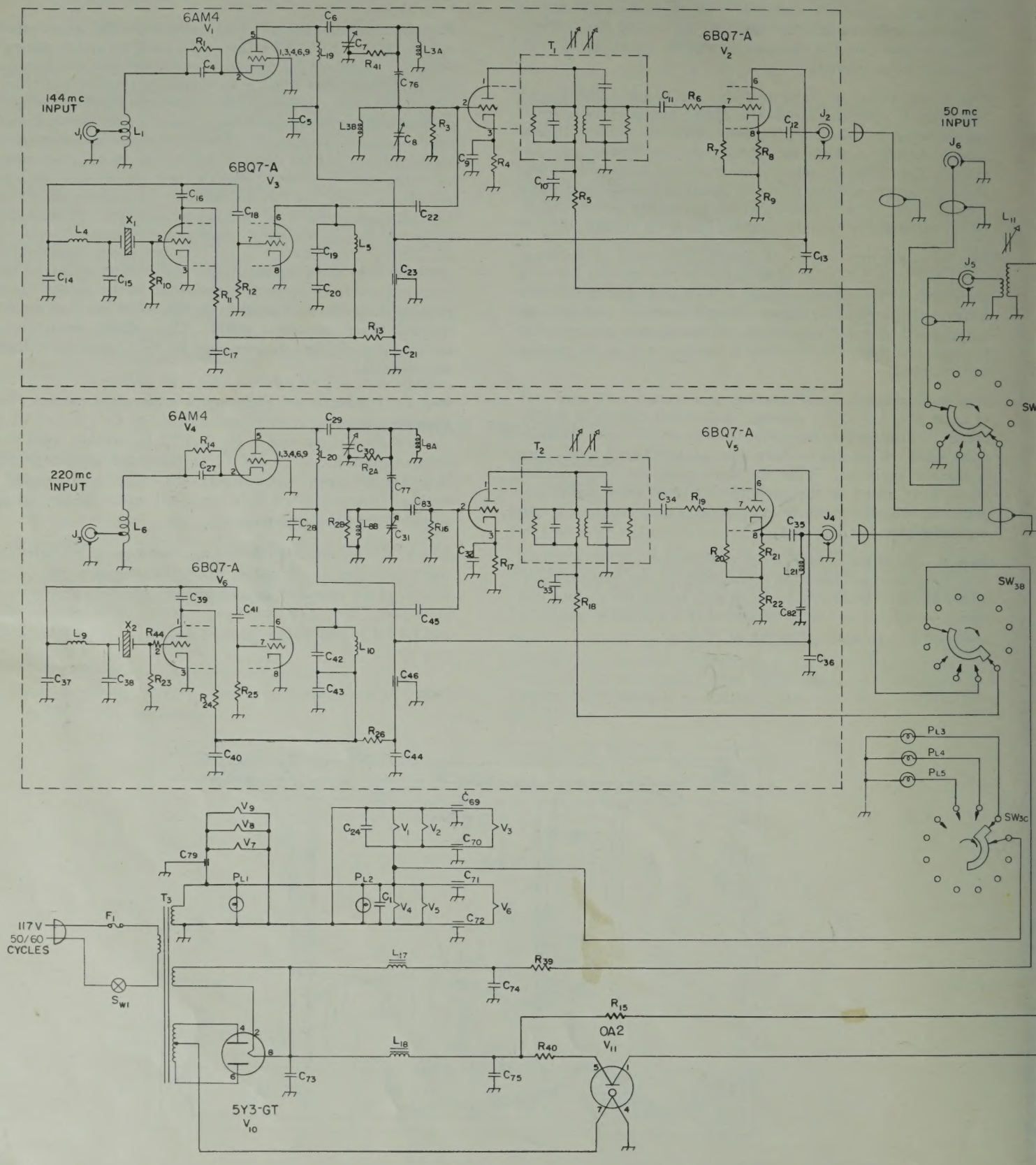
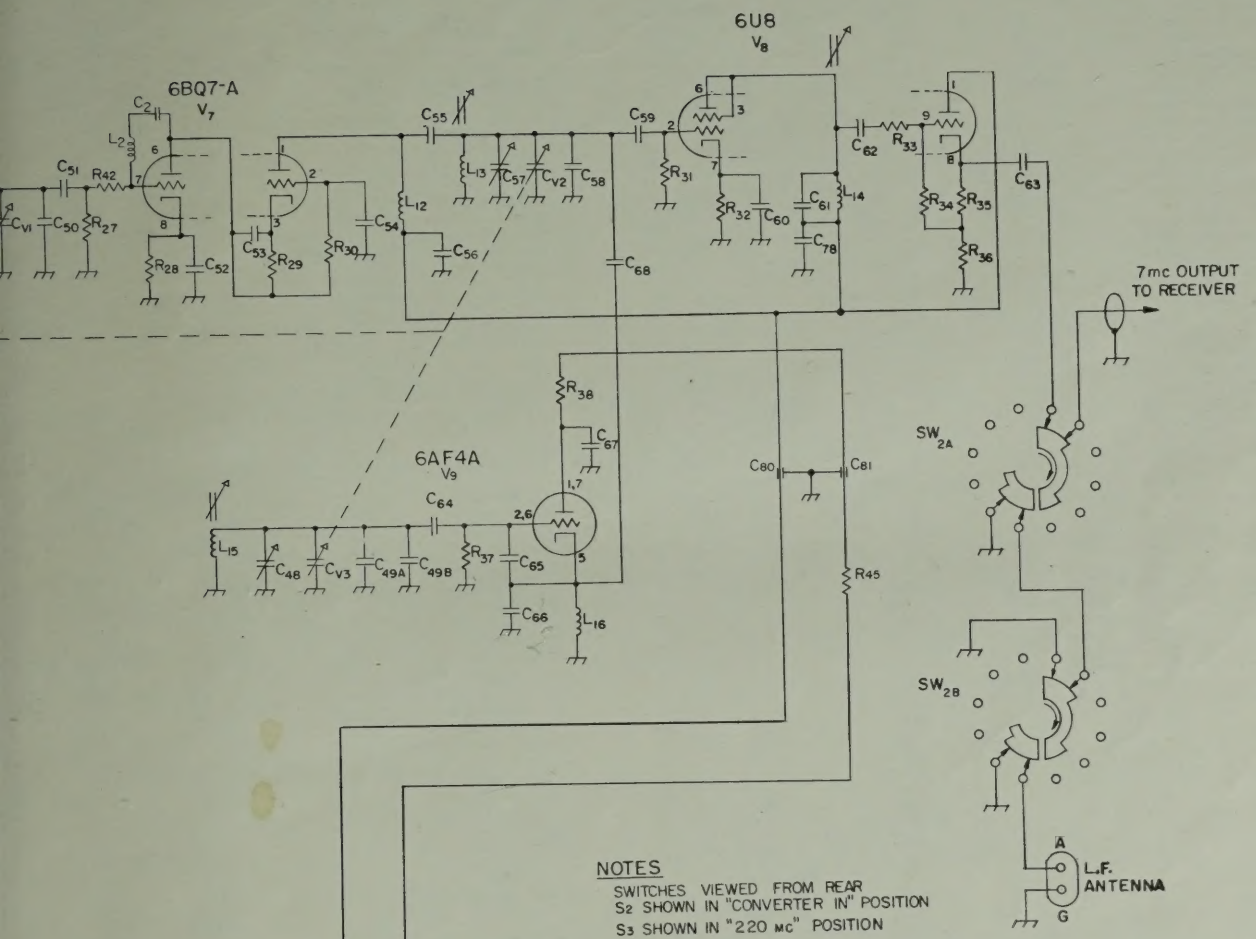


Fig. 4—Bottom Chassis Layout


6AM4
V1
144mc
INPUT
J1
L1
6BQ7-A
V3
6BQ7-A
V2
T1
50 mc
INPUT
J6
J5
J2
220mc
INPUT
J3
L6
6AM4
V4
6BQ7-A
V6
6BQ7-A
V5
T2
J4
SW3B
PL3
PL4
PL5
SW3C
V9
V8
V7
PL1
PL2
T3
117 V
50/60
CYCLES
F1
SW1
5Y3-GT
V10
0A2
V11



NOTES

SWITCHES VIEWED FROM REAR
S2 SHOWN IN "CONVERTER IN" POSITION
S3 SHOWN IN "220 MC" POSITION

MODEL VHF126 VOLTAGE CHART

SYM	TUBE	TUBE FUNCTION	SOCKET PIN NO.								
			1	2	3	4	5	6	7	8	9
V1	6AM4	144 MC. RF. AMP.	0	1.0	0	0	170	0	0	6.2 AC	0
V2	6BQ7A	MIXER	160	0	3.0	0	6.2 AC	170	18 (3)	25	0
V3	6BQ7A	OSC. DBLR.	100	-3.6 (2)	0	6.2 AC	0	160	-18 (3)	0	0
V4	6AM4	220 MC. RF. AMP.	0	1.0	0	0	165	0	0	6.2 AC	0
V5	6BQ7A	220 MC. MIXER OUTPUT	160	0	3.0	0	6.2 AC	170	18 (3)	25	0
V6	6BQ7A	220 MC. OXC. DBLR.	100	-3.6 (2)	0	6.2 AC	0	165	-.45 (1)	0	0
V7	6BQ7A	50 MC. RF. CASCODE	117	34	75	0	6.2 AC	73	0	.75	0
V8	6U8	50 MC. MIXER OUTPUT	117	0	145	6.2 AC	0	145	2.9	13	12 (3)
V9	6AF4A	50 MC. OSC.	75	-55 (3)	0	6.2 AC	0	-5.5 (1)	75	—	—
V10	5Y3GT	RECT.	0	250	0	260 AC	0	260 AC	0	250	—
V11	0a2	REGULATOR	150	—	—	0	150	—	0	—	—

MEASUREMENT CONDITIONS
(Tabulated voltages may vary ±15%)

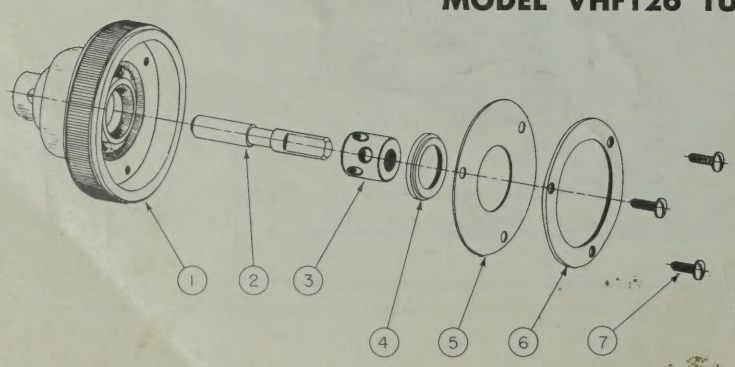
Note 1. Voltages are +DC to ground unless otherwise noted.
Note 2. 2.5 mh choke used in series with 20,000 ohms/v meter. Choke is placed at probe tip.
Note 3. VTVM (11 meg ohm input resistance) to be used.
General: All DC voltages unless otherwise noted are measured with 20,000 ohms/volt meter or higher.
All AC voltages are measured with AC meter having resistance of 1000 ohms per volt or greater

PARTS LIST

Key	Description	E-V Part No.
R1	Resistor, 56 OHM, ½W, Carbon	4622
R2A	Resistor, 4.7K OHM, ½W, Carbon	4638
R2B	Resistor, 4.7K OHM, ½W, Carbon	4638
R3	Resistor, 3.3K OHM, ½W, Carbon	46125
R4	Resistor, 470 OHM, ½W, Carbon	4654
R5	Resistor, 1K OHM, ½W, Carbon	4614
R6	Resistor, 56 OHM, ½W, Carbon	4622
R7	Resistor, 270K OHM, ½W, Carbon	4669
R8	Resistor, 220 OHM, ½W, Carbon	4664
R9	Resistor, 2.2K OHM, ½W, Carbon	46042
R10	Resistor, 10K OHM, ½W, Carbon	4613
R11	Resistor, 4.7K OHM, ½W, Carbon	4638
R12	Resistor, 100K OHM, ½W, Carbon	4695
R13	Resistor, 1K OHM, ½W, Carbon	4614
R14	Resistor, 56 OHM, ½W, Carbon	4622
R15	Resistor, 5K OHM, 5W, W.W.	46116
R16	Resistor, 100K OHM, ½W, Carbon	4644
R17	Resistor, 470 OHM, ½W, Carbon	4654
R18	Resistor, 1K OHM, ½W, Carbon	4614
R19	Resistor, 56 OHM, ½W, Carbon	4622
R20	Resistor, 270K OHM, ½W, Carbon	4669
R21	Resistor, 220 OHM, ½W, Carbon	4664
R22	Resistor, 2.2K OHM, ½W, Carbon	46042
R23	Resistor, 10K OHM, ½W, Carbon	4613
R24	Resistor, 4.7K OHM, ½W, Carbon	4638
R25	Resistor, 100K OHM, ½W, Carbon	4695
R26	Resistor, 1K OHM, ½W, Carbon	4614
R27	Resistor, 270K OHM, ½W, Carbon	4669
R28	Resistor, 68 OHM, ½W, Carbon	4631
R29	Resistor, 56 OHM, ½W Carbon	4622
R30	Resistor, 270K OHM, ½W, Carbon	4669
R31	Resistor, 270K OHM, ½W, Carbon	4669
R32	Resistor, 330 OHM, ½W, Carbon	4623
R33	Resistor, 16 OHM, ½W, Carbon	46069
R34	Resistor, 270K OHM, ½W, Carbon	4669
R35	Resistor, 68 OHM, ½W, Carbon	4631
R36	Resistor, 1.5K OHM, ½W, Carbon	46046
R37	Resistor, 10K OHM, ½W, Carbon	4691
R38	Resistor, 2.2K OHM, ½W, Carbon	46042
R39	Resistor, 1250 OHM, 10W, W.W.	46114
R40	Resistor, 2000 OHM, 10W, W.W.	46115
R41	Resistor, 3.3K OHM, ½W, Carbon	46125
R42	Resistor, 15 OHM, ½W, Carbon	46069
R43	Resistor, 15 OHM, ½W, Carbon	46069
R44	Resistor, 15 OHM, ½W, Carbon	46069
C1	Capacitor, .01 MFD	4252
C2	Capacitor, .001 MFD, ±20%, 500 V, Ceramic	4258
C4	Capacitor, .001 MFD, ±20%, 500 V, Ceramic	4258
C5	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C6	Capacitor, 50 MMF, ±2%, 500 V, Ceramic	42067
C7	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C8	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C9	Capacitor, .001 MFD, ±20%, 500 V, Ceramic	4258
C10	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C11	Capacitor, .001 MFD, ±20%, 500 V, Ceramic	4258
C12	Capacitor, .001 MFD, ±20% 500 V, Ceramic	4258
C13	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C14	Capacitor, 10 MMF	42029
C15	Capacitor, 100 MMF	4297
C16	Capacitor, .01 MFD	4252
C17	Capacitor, .01 MFD	4252
C18	Capacitor, 30 MMF	42149
C19	Capacitor, 10 MMF	42029
C20	Capacitor, .01 MFD	4252
C21	Capacitor, .001 MFD	4258
C22	Capacitor, 1 MMF	42150
C23	Capacitor, .001 MFD Feed Thru	42152
C24	Capacitor, .01 MFD	4252
C27	Capacitor, .001 MFD	4258
C28	Capacitor, .01 MFD	4252
C29	Capacitor, 50 MMF.	42067
C30	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C31	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C32	Capacitor, .001 MFD	4258
C33	Capacitor, .01 MFD	4252
C34	Capacitor, .001 MFD	4258
C35	Capacitor, .001 MFD	4258
C36	Capacitor, .01 MFD	4252
C37	Capacitor, 10 MMF	42029
C38	Capacitor, 30 MMF	42149
C39	Capacitor, .01 MFD	4252
C40	Capacitor, .01 MFD	4252
C41	Capacitor, 30 MMF	42149
C42	Capacitor, 10 MMF	42029
C43	Capacitor, .01 MFD	4252
C44	Capacitor, .001 MFD	4258
C45	Capacitor, 1 MMF, ±5%, NPO, 500 V, Ceramic	42150
C46	Capacitor, .001 MFD, Feed Thru	42152
C47	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C48	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018

Key	Description	E-V Part No.
C49A	Capacitor, 30 MMF, 2% NPO, 500 V, Ceramic	42048
C49B	Capacitor, 15 MMF, 2% N750, 500 V, Ceramic	42039
C50	Capacitor, 45 MMF, 5% NPO, 500 V, Ceramic	42147
C51	Capacitor, 10 MMF, 5% NPO, 500 V, Ceramic	42029
C52	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C53	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C54	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C55	Capacitor, 20 MMF, 10% NPO, 500 V, Ceramic	42026
C56	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C57	Capacitor, 1-9 MMF, Ceramic Tubular, Adjustable	42018
C58	Capacitor, 45 MMF, 5% NPO, 500 V, Ceramic	42147
C59	Capacitor, 50 MMF, ±2% NPO, 500 V, Ceramic	42027
C60	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C61	Capacitor, 45 MMF, 5% NPO, 500 V, Ceramic	42147
C62	Capacitor, .001 MFD, ±20%, 500 V, Ceramic	4258
C63	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C64	Capacitor, 30 MMF, 2% NPO, 500 V, Ceramic	42048
C65	Capacitor, 50 MMF, ±2%, 500 V, Ceramic	42027
C66	Capacitor, 50 MMF, ±2%, 500 V, Ceramic	42027
C67	Capacitor, .01MFD, GMV, 500 V, Ceramic	4262
C68	Capacitor, 2 MMF, 5% NPO, 500 V, Ceramic	42040
C69	Capacitor, .001 MFD, Feed Thru	42152
C70	Capacitor, .001 MFD, Feed Thru	42152
C71	Capacitor, .001 MFD, Feed Thru	42152
C72	Capacitor, .001 MFD, Feed Thru	42152
C73	Capacitor, 10 MFD, 450 V, Electrolytic	42019
C74	Capacitor, 15 MFD	
C75	Capacitor, 15 MFD	
C76	Capacitor, .5MMF, ± 10% NPO	42165
C77	Capacitor, .5MMF, ± 10% NPO	42165
C78	Capacitor, .01 MFD, GMV, 500 V, Ceramic	4252
C83	Capacitor, 10 MMF, 10% NPO, 500 V	42164
CV 1, 2, 3	Capacitor, Tuning	42151
V1	6AM4, Grounded Grid Amp, 144 MC	4310
V2	6BQ7-A, Mixer-Follower, 144 MC	4367
V3	6BQ7-A, Osc-Doubler, 144 MC	4367
V4	6AM4, Grounded Grid Amp, 220 MC	4310
V5	6BQ7-A, Mixer-Foller, 220 MC	4367
V6	6BQ7-A, Osc-Doubler, 220 MC	4367
V7	6BQ7-A, Cascade RF AMP, 50 MC	4367
V8	6U8, Mixer-Follower, 50 MC	4331
V9	6AF4-A, Tuner ASC	4308
V10	5Y3-GT, Rectifier	4314
V11	OA2, Voltage Regulator	4330
PL1	#51 Pilot Light	4348
PL2	#51 Pilot Light	4348
PL3	#51 Pilot Light	4348
PL4	#51 Pilot Light	4348
PL5	#51 Pilot Light	4348
L1	Antenna Coil	35017
L2	Neutralizing Coil, 50 MC	
L3A	R.F. Mixer Coil, 144 MC	35018
L3B	R.F. Mixer Coil, 144 MC	A35018
L4	Oscillator Coil, 47.5 MC	A35014
L5	Doubler Coil, 95 MC	B35014
L6	Antenna Coil, 220 MC	35019
L8A	RF Mixer Coil, 200 MC	35020
L8B	RF Mixer Coil, 200 MC	35020
L9	Oscillator Coil, 85.5 MC	C35014
L10	Doubler Coil, 171 MC	D35014
L11	Antenna Coil, 50 MC	35015
L12	Choke Ohmite Z50	15054
L13	RF Mixer Coil, 50 MC	E35014
L14	IF Output Coil, 7 MC	B3594
L15	Oscillator Coil, 50 MC	35021
L16	Choke, 1 MH	35016
L17	Filter Choke	15015
L18	Filter Choke	15015
L19	Choke Ohmite Z144	15055
L20	Choke Ohmite Z144	15055
T1	RF Transformer, 50 MC, Bandpass	15051
T2	RF Transformer, 50 MC, Bandpass	15051
T3	Power Transformer	15053
J1		1795
J2		1795
J3		1795
J4		1795
J5		1795
J6		17037
X1	Crystal, 47.5 MC	7150
X2	Crystal, 85.5 MC	7151
SW1	SPST Rotary Power Switch	B5648
SW2	Converter "In-Out" Switch	5698
SW3	Band Switch	5697
F1	Fuse, 1½ Amp., Slow-Blow	20171

MODEL VHF126 TURNING KNOB ASSEMBLY



TUNING KNOB ASSEMBLY — All part numbers (2) through (7) can be disassembled and assembled from the housing (1) without dismounting (1) from panel and shaft. Slipping of knob or failure of pointer to follow knob may be the result of insufficient tension on the plate (5). Remedy by removing the front knob and tightening the three screws (7) ⅛ turn each.

TUNING KNOB PARTS LIST

1 — Housing (A72433AB) with insert (72434) and 19 balls (20245)
2 — Shaft (72431)
3 — Ball cage (72430) with 6 balls (20246)
4 — Ring (72428)
5 — Plate (72429)
6 — Ring (72443)
7 — 3 screws (6031E5)

Printed in U.S.A.

THE RME VHF-152A

RADIO FREQUENCY CONVERTER

OPERATING and SERVICE MANUAL

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RADIO MFG. ENGINEERS, INC.
PEORIA 6, ILLINOIS

RME WARRANTY

Radio Mfg. Engineers, Inc. warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

RADIO MFG. ENGINEERS, INC. 300-306 First Avenue Peoria, Illinois

SECTION I

General Description

1.1 Introduction

The VHF-152A Frequency Converter has been designed for use with a conventional communication type receiver to extend its range to cover the 11, 10, 6 and 2 meter amateur bands. The unit consists of an RF amplifier, a mixer, and a high frequency oscillator. The function of the unit is to convert the very high frequencies received by it to a new fixed frequency of 7 megacycles which is fed to the receiver and amplified and detected in the normal manner. This system of receiving may be described as a double heterodyne system. Its advantages are: high image rejection, since the image is 14 megacycles from the signal; and high selectivity which is provided by the selective low frequency intermediate frequency amplifier of the receiver. The auxiliary controls on the receiver, such as the beat frequency oscillator, the noise limiter, and RF and audio gain controls, function in the normal manner, as does the signal strength meter if the receiver is equipped with one. The RME-45 and RME-84 Receivers are admirably suited for use with the VHF-152A Converter.

1.2 Specifications

Power Supply: 115 volts, 50-60 cycles, single phase*
Power Consumption: 40 watts at 115 volts
Output Frequency: 7 mc (7000 kc) (Nominal)
Overall Cabinet Dimensions: Length 12 inches Width 11 inches Depth 11 inches
Weight: 19.5 pounds
Frequency Range: 27.0 - 29.8 mc
49.5 - 54.2 mc
143.8 -148.2 mc

*NOTE: On special order the VHF-152A may be obtained with a special power transformer suitable for operation on 115-230 volts 25-60 cycles.

1.3 Tube Complement

	Type	Use	Schematic Symbol
1.	6AK5	RF Amplifier	VT-1
2.	6J6	Mixer-Oscillator	VT-2
3.	VR150	Voltage Regulator	VT-3
4.	5Y3G	Rectifier	VT-4

SECTION II

Installation

2.1 Inspection

The VHF-152A Converter should be carefully checked on receipt for any mechanical damage that may have resulted in transit. If any such damage is found, a claim should be filed with the carrier. No claim can be filed at the shipping point and Radio Mfg. Engineers, Inc. cannot be responsible for any damage incurred while in the hands of the carrier.

2.2 External Connections

To place the VHF-152A in operation the line cord should be plugged into a suitable power source. The standard model is designed for operation on 110-120 volt 50-60 cycle AC line only. Use of the VHF-152A on any other voltage or frequency may result in damage.

The output cable (Fig. 2) should be connected to the antenna terminal of the receiver. The cable has two shielded leads and a ground lead each ending in a terminal lug. On receivers which have provision for doublet operation, such as the RME-45 and the RME-84, the blue coded lead must be connected to the antenna terminal farthest from the ground terminal. This is the hot side of the converter output. The red lead, or low side, must be connected to the antenna terminal nearest to the ground terminal. The ground braid should be connected to the receiver ground. On receivers not equipped for doublet operation, the blue lead should be connected to the antenna terminal and the red and ground (shield) leads should be connected to the receiver ground. This lead is coded white. Unless the above instructions are followed, the changeover switch (Par. 3.3) will not operate properly.

If an RME-DB-20 Preselector is used ahead of the receiver, the connections will be made as above except that the converter output cable connects in the same manner to the DB-20 antenna terminals instead of to the receiver.

2.3 Precautions

IMPORTANT - Attempted operation of the VHF-152A on any voltage or frequency other than that for which it is designed will result in damage to the unit. The operator must be sure that the supply is correct before plugging in the converter.

2.4 Antennas

On frequencies of 30 megacycles and above, the use of a resonant antenna is mandatory. For this reason the VHF-152A is provided with separate antenna.

connection for each frequency band. On the terminal strip on the rear apron (Fig. 2) are four sets of two terminals each. These terminals are marked "2" for the 144-148 mc band: "6" for the 50-54 mc band, and "10" for the 27-29.7 mc band. The input impedance for each band has been designed to be 300 ohms so that the owner may make use of the 300 ohm twin lead line now available. The remaining set of two terminals marked "LF" are for connecting the low frequency antenna used with the receiver. This pair of terminals is connected through to the receiver when the antenna changeover switch (Par. 3.3) is turned to "OUT". For information regarding antenna design and dimensions reference should be made to the ARRL Amateur Handbook, available at all Radio Supply Stores.

SECTION III

Operation and Circuit Details

3.1 Introduction

The VHF-152A operates in conjunction with a communication type receiver tuned to approximately 7 mc. The accuracy of setting the receiver will affect the accuracy of calibration of the VHF-152A by the same amount. That is to say if the low frequency receiver is off 100 kilocycles, the calibration of the VHF-152A will also be off by 100 kilocycles. It should be noted that the operator is not bound to use the output frequency of exactly 7.0 mc. If interference is encountered he may move the receiver tuning slightly to a clear channel, realizing that the VHF-152A calibration will change by the same amount the low frequency receiver was moved. If it is necessary to move the receiver frequency so far that the calibration is affected, he may recalibrate by following instructions in Section IV. It is not recommended that the output frequency be moved more than 50 kc higher or lower than 7.0 mc because of tracking troubles that may be encountered. In the factory the I.F. is left aligned at 6950 kc.

In double heterodyne receiving systems spurious signals may be received which are harmonics of the receiver local oscillator. On the VHF-152 two such signals may be received. One signal will be heard at 29.8 mc, which is outside the 27-29.7 mc band. Another may be heard at 52.2 mc. If it is found that this spurious signal falls on a real signal which is desired, the spurious signal may be moved by changing the receiver tuning slightly.

3.2 Line Switch

The equipment is turned on by means of the line switch on the right hand side of the control panel (Fig. 1).

3.3 Changeover Switch

On the left side of the control panel (Fig. 1) is the changeover switch. When this switch is turned to "IN", the output of the VHF-152A is fed to the receiver input terminals. At the same time the low frequency antenna terminals are grounded to prevent 7 mc signals from feeding through the VHF-152A to the receiver. When the changeover switch is turned to "OUT" the output of the VHF-152A is grounded and the low frequency "LF" (Fig. 2) antenna terminals are connected through to the receiver. Thus by turning the changeover switch to "OUT" the receiver functions normally.

3.4 Band Switch

In the center of the control panel (Fig. 1) is the band change switch. This switch has three positions marked: 144-148, 50-54, and 27-29.7, and is used to switch the VHF-152A to the desired range.

3.5 RF Stage Peaking

When the VHF-152A leaves the factory, the stages are peaked to maximum sensitivity. It may be found that some antennas may reflect a reactance into the RF stage that will detune it slightly. With the antenna for a certain band connected the RF padder for that band may be peaked up by listening to a signal. Figure IV shows the location of the RF padders for each band. To get at the padders it is necessary to remove the bottom cover plate.

3.6 IF Stage Peaking

The IF transformer on the VHF-152A (Fig. 3) is peaked at the factory at 6.95 mc. Different receivers connected to the output may change this tuning slightly. The owner should check the peaking of this transformer with the receiver connected. Peaking is accomplished by turning the screw on the top of the can. The screw should be adjusted for maximum gain as indicated by a received signal or maximum background noise if a signal is not available.

SECTION IV

Maintenance and Service

4.1 Introduction

No maintenance of importance is required on the VHF-152A. It is suggested that dust that may accumulate in the cabinet be blown out periodically.

SECTION IV

Maintenance and Service

The owner may, if he has an accurate signal source available, recalibrate his converter as discussed in succeeding paragraphs. It should be born in mind that the calibration of the converter is affected by the setting of the companion receiver (Par. 3.1.). Therefore, before attempting to recalibrate the converter, the calibration of the receiver should be checked.

The VHF-152A will drift somewhat during the first three minutes after being turned on and to a much less extent during the next ten or twenty minutes. It is recommended that no attempt be made to recalibrate or align the equipment until it has reached a stable temperature.

All calibrating and alignment should be done with the receiver connected and the changeover switch (Par. 3.3) in the "IN" position.

If the receiver has a carrier level meter such as is on the RME-45, this meter is used as a tuning indicator when peaking the circuits. If the receiver is not equipped with a meter, it will be necessary to connect an audio output meter to the receiver for a tuning indicator. When using an audio output meter, it is necessary to remove the AVC from the receiver.

4.2 IF Coil Alignment

As pointed out in Paragraph 3.1, the VHF-152A is calibrated and aligned for an output frequency of 6.95 mc. The output tuning is controlled by the screw on the top of the aluminum can on the top of the chassis (Fig. 3). The transformer may be peaked with a 6.95 mc signal fed into the mixer grid or with a signal tuned in on the converter. Connection to the mixer grid is most easily made on the stator of the center section of the tuning condenser. In either case, the transformer is adjusted to maximum sensitivity as indicated by the meter on the receiver.

4.3 Calibration

Calibration of the VHF-152A should not be attempted unless it is definitely established that the calibration is off.

Calibration is controlled by the oscillator padders (Fig. 4). These padders are made accessible by removal of the cabinet bottom plate. Beneath this plate is a second aluminum plate in which are padder access holes. All calibrating and aligning should be done with this cover on, the proper padder for each band may be determined by referring to Figure IV.

High beat is used on all bands. That is to say, the oscillator is always 7 mc (approximately) above the received signal. As in the case of all super heterodyne receivers, if sufficient input is used each signal may be received at two points differing by twice the IF frequency. With a signal being received, the padder setting that gives the highest oscillator frequency is the proper setting.

one with the receiver connected and

level meter even no ig on the VU-Set; this meter
then peaking the circuits. If the receiver is
, it will be necessary to connect an audio output
a tuning indicator. Then using an audio output
move the VTVM from the receiver.

The two low frequency ranges have iron core oscillator coils. The screws for adjusting the inductance of these coils is accessible on the top of the chassis. Unless the screws have been disturbed, adjustment should never be necessary.

4.4 RF Alignment

When the calibration is correct, the RF circuits should be aligned. Figure 4 shows the location of the RF amplifier and mixer grid padders for each band. Each of these padders should be adjusted for maximum sensitivity as indicated by the meter on the receiver.

When using a signal generator in aligning the VHF-152A a 300 ohm resistor should be inserted between the signal generator and the antenna terminals in order that the low impedance of the signal generator will not swamp the RF circuit and cause a misalignment of this circuit. Best results will be obtained when the RF circuit is aligned with the antenna connected. See paragraph 3.5.

4.5 Voltage Charts

As an aid in trouble shooting on the VHF-152A the following chart of voltages at various points in the circuit is tabulated below. Voltage readings should be made with a voltmeter of at least 2000 ohms per volt resistance. Variation of ±15% may be expected. All voltages are measured from the point indicated to ground unless otherwise indicated.

Circuit	Volts
RF Plate	170
RF Screen	115
RF Cathode	2.0
Mixer Plate	150
Osc. Mixer Cathode	5
Osc. Plate	60 (From cold side of choke)
Osc. Grid*	-3.0 (2 Meters), -4.7 (6 Meters), -5.5 (10 Meters)

* Note: Measured between Osc. grid and cathode with a 2.5 mh choke in series with voltmeter lead to grid.

VHF-152A PARTS LIST

Dwg. B-282
Rev. 0112050

NO.	COMPONENT
RESISTORS	
1.1	22 ohm 1/2 watt ±20% carbon
1.2	220 ohm 1/2 watt ±10% carbon
1.3	15K ohm 1/2 watt ±10% carbon
1.4	18K ohm 2 watt ±10% carbon
1.5	55 ohm 1/2 watt ±20% carbon
1.6	2000 ohm 1/2 watt ±10% carbon
1.7	4.7K ohm 1/2 watt ±10% carbon
1.8	18K ohm 2 watt ±10% carbon
1.9	3.5K ohm 10 watt wire wound
1.10	100K ohms 20% 1/2 watt resistor
1.11	33 ohms 20% 1/2 watt resistor
1.12	100K ohms 20% 1/2 watt
CAPACITORS	
[illegible]	30 μμfd. Mica Padder
[illegible]	10 μμfd. Mica Padder
[illegible]	10 μμfd. Mica Padder
[illegible]	15 μμfd. Ceramic ±5%
[illegible]	Tuning Condenser R. F. Section
[illegible]	Tuning Condenser Mixer Section
[illegible]	Tuning Condenser Oscillator Section
[illegible]	2000 μμfd. 20% Mica
[illegible]	1000 μμfd. 20% 500 volt
[illegible]	15 μμfd. 5% Ceramic
[illegible]	30 μμfd. Mica Padder
[illegible]	10 μμfd. Mica Padder
[illegible]	10 μμfd. Mica Padder
[illegible]	100 μμfd. ±10% Ceramic
[illegible]	1.5 μμfd. ±.25 μμfd. Ceramic
[illegible]	1000 μμfd. ±20% Mica
[illegible]	25 μμfd. ±10% Ceramic
[illegible]	.01 μfd. 600 volt paper
[illegible]	100 μμfd. Mica Padder
[illegible]	1000 μμfd. 500 V. Mica
[illegible]	1000 μμfd. 20% 500 volt
[illegible]	1000 μμfd. 20%
[illegible]	25 μμfd. 10% Ceramic Neg. Temp. Coeff.
[illegible]	25 μμfd. 10% Ceramic Neg. Temp. Coeff.
[illegible]	1-8 μμfd. Ceramic Padder Neg. Temp. Coeff.
[illegible]	4-25 μμfd. Ceramic Padder Neg. Temp. Coeff.
[illegible]	4-25 μμfd. Ceramic Padder Neg. Temp. Coeff.
[illegible]	1-8 μμfd. adj. Ceramic Padder Neg. Temp. Coeff.
[illegible]	25 μμfd. Ceramic Padder Neg. Temp Coeff.
[illegible]	10 μfd. Electrolytic 450 volt
[illegible]	10 μfd. Electrolytic 450 volt
[illegible]	15 μμf. 5% Ceramic Condenser
[illegible]	25 μμf. ±10% Ceramic Condenser
[illegible]	1000 μμfd. ±20% 600 V. Mica Condenser
[illegible]	5 μμfd. Ceramic ±5% - NTC 150
[illegible]	5 μμfd. ±10%

NO.	COMPONENT
SWITCHES	
3.7	AC Line Switch SPST
3.8	Changeover Switch 4PDT
COILS	
4.1	2 Meter R.F. Coil
4.2	10 Meter R.F. Coil
4.3	6 Meter R.F. Coil
4.4	2 Meter Mixer Coil
4.5	10 Meter Mixer Coil
4.6	6 Meter Mixer Coil
4.7	2 Meter Oscillator Coil
4.8	10 Meter Oscillator Coil
4.9	6 Meter Oscillator Coil
4.10	Oscillator Plate Choke
4.11	Power Supply Filter Choke
4.12	7 mc L.F. Coil
TRANSFORMERS	
5.1	7 mc I.F. Transformer
5.2	Power Transformer

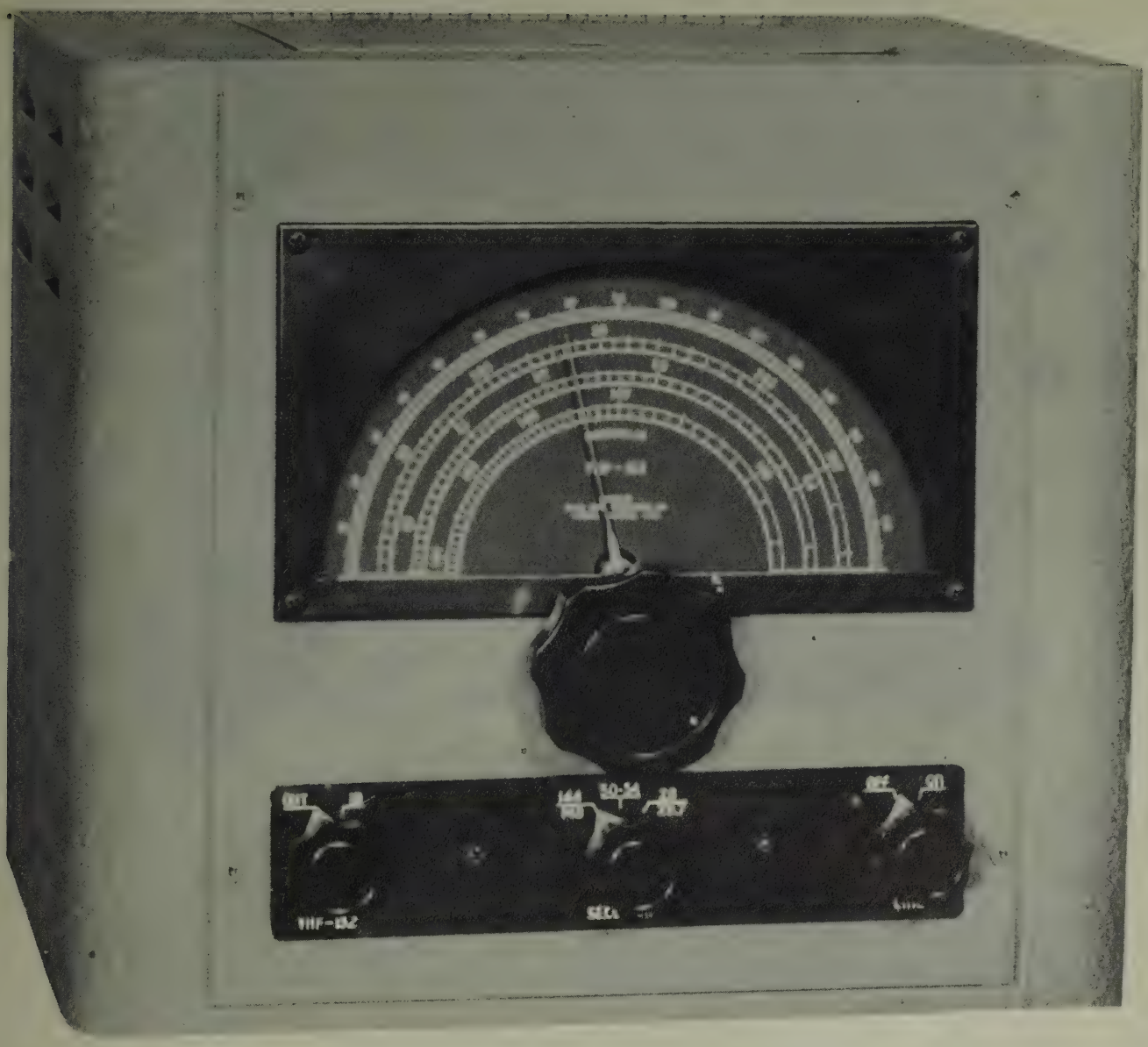


FIG. 1

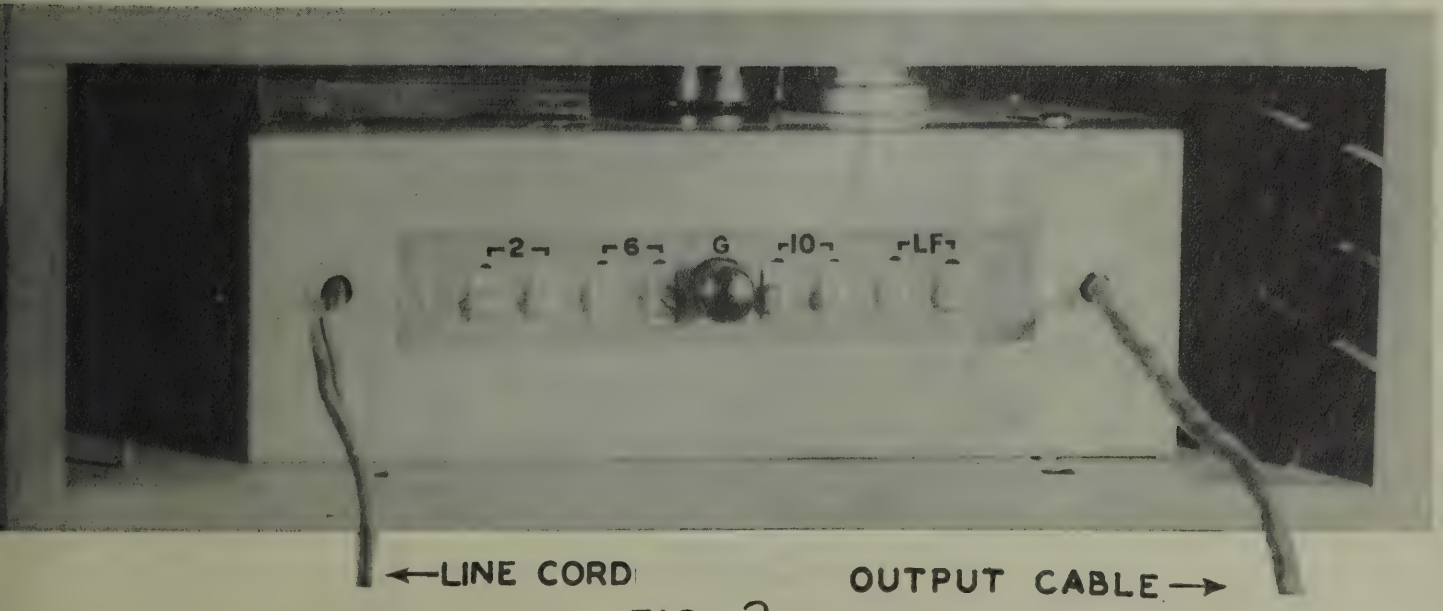


FIG.-2

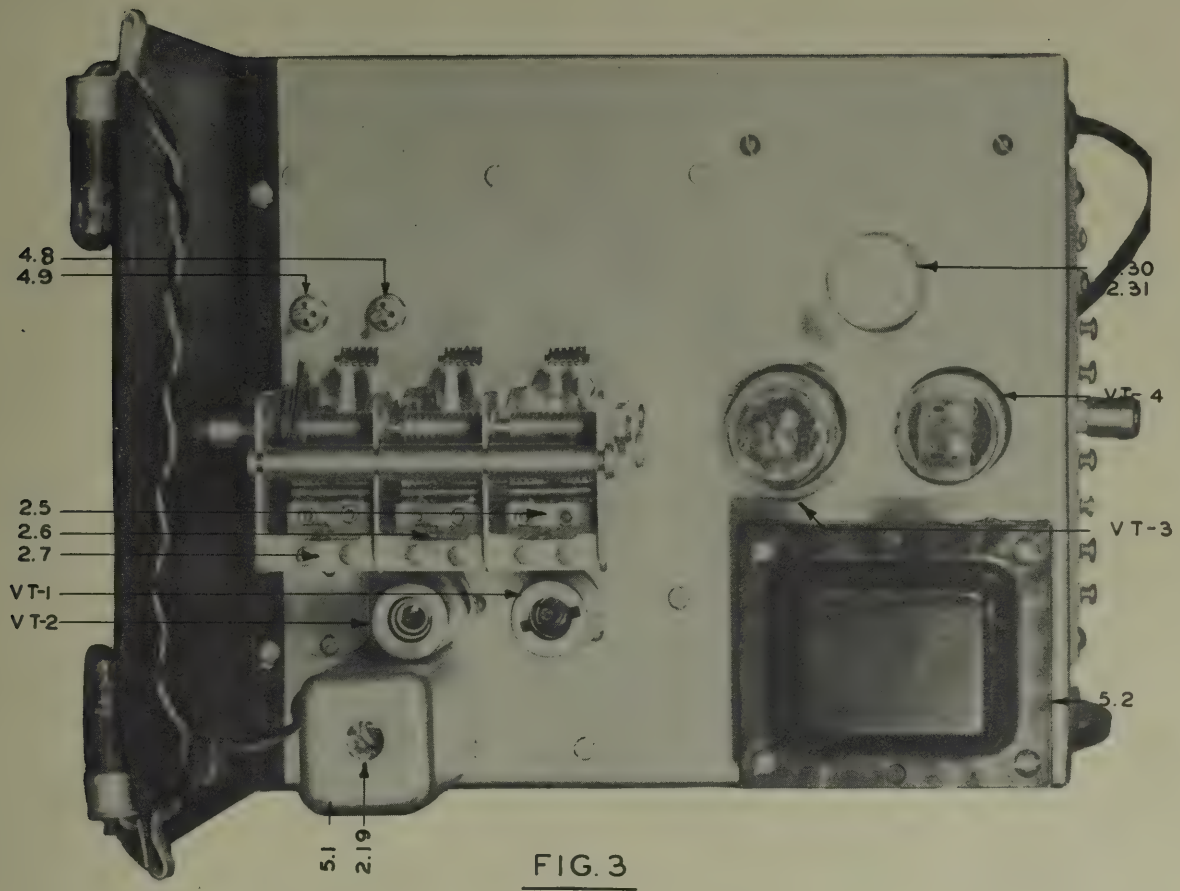

4.8
4.9
2.5
2.6
2.7
VT-1
VT-2
5.1
2.19
2.30
2.31
VT-4
VT-3
5.2

FIG. 3

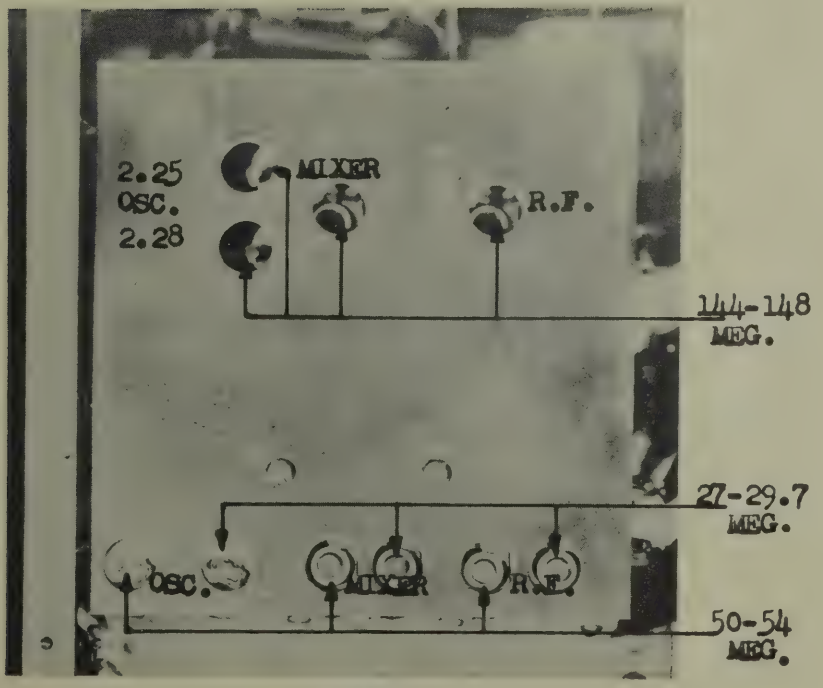
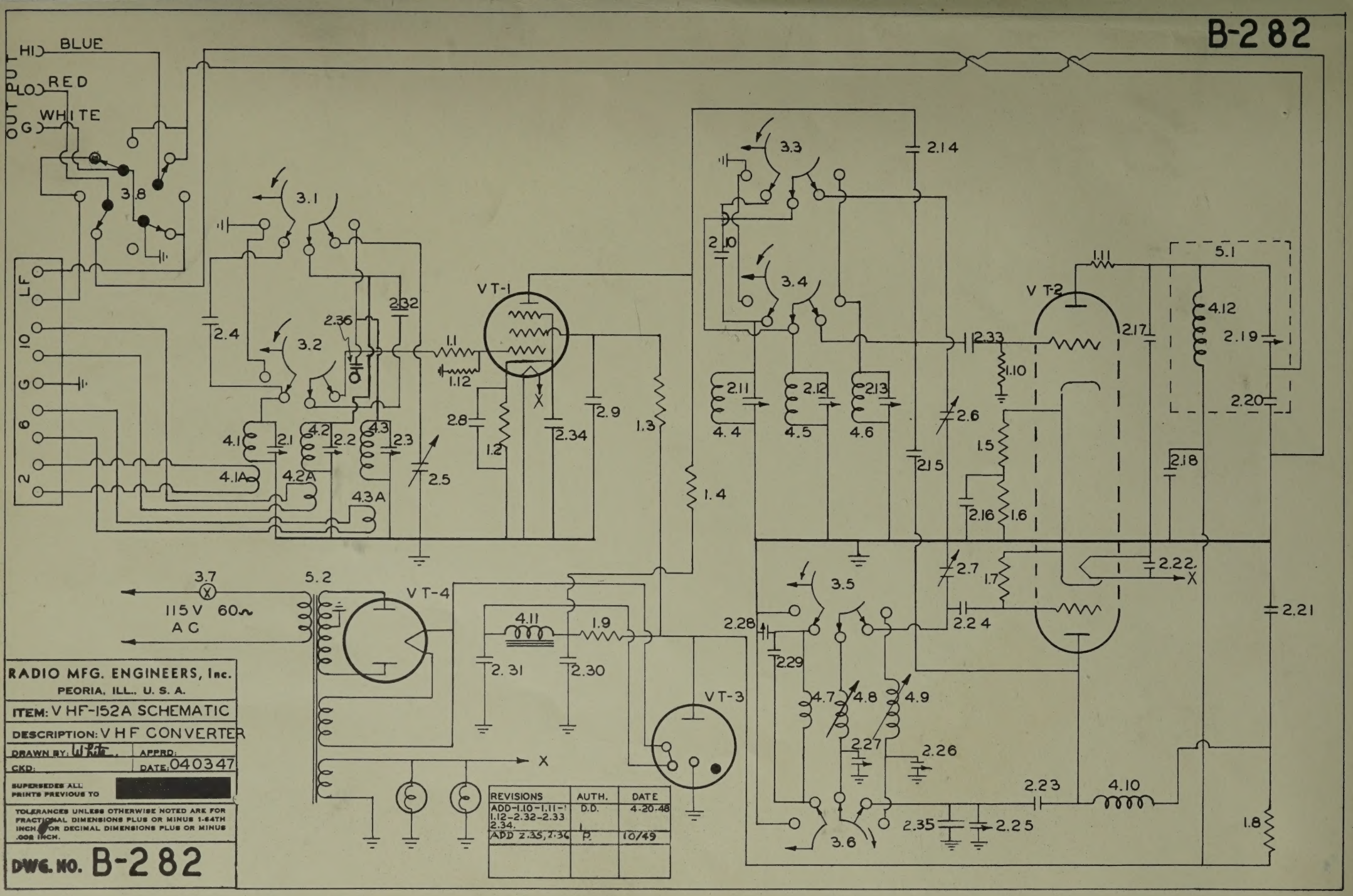

2.25
OSC.
2.28
MIXER
R.F.
144-148
MEG.
27-29.7
MEG.
OSC.
MIXER
R.F.
50-54
MEG.

FIG. 4

B-282



REVISIONS	AUTH.	DATE
ADD-1.10-1.11-1.12-2.32-2.33 2.34.	D.D.	4-20-48
ADD 2.35, 2.36	P.	10/49

RADIO MFG. ENGINEERS, Inc.
PEORIA, ILL., U. S. A.

ITEM: V HF-152A SCHEMATIC

DESCRIPTION: V H F CONVERTER

DRAWN BY: W Pate | APPRD:

CKD: | DATE: 040347

SUPERSEDES ALL PRINTS PREVIOUS TO [redacted]

TOLERANCES UNLESS OTHERWISE NOTED ARE FOR FRACTIONAL DIMENSIONS PLUS OR MINUS 1-64TH INCH AND FOR DECIMAL DIMENSIONS PLUS OR MINUS .005 INCH.

DWG. NO. B-282